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ABSTRACT

As a result of using the Rasch model in building item banks in reading and mathematics, we were able to design two new testing programs for our district. The first was a grade level competency-based evaluation program designed to identify our district's low achievement-level students as well as the precompetency goals on which they needed help. The second was an ungraded testing program designed to replace our wide-range standardized testing by a series of short level tests which were assigned to students to match their individual achievement levels. In undertaking this task, we found that the Rasch-calibrated item bank made it possible to precisely design these tests to meet the needs of our district. Based on this year's experience, we believe that item banks with Rasch scaling provide a level of flexibility and precision unavailable in the past. (Author)

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# Using the Rasch Approach to Measurement to Solve Practical School Testing Problems

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Abstract

Over the past four years, our district has worked with the Northwest Evaluation Association in the development of Rasch-calibrated item banks in reading, mathematics, and language arts. This fall we used these banks to develop two new district testing programs; one program designed to identify low achievement level students and a second program designed to provide each student a narrow range survey test matched to his achievement level. We found that the Rasch test model significantly increased the precision and flexibility of both testing programs.

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# Using the Rasch Model to Improve Your District's Testing Program *

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## Background

Many large-city school systems have adopted an "off-level" testing approach designed to improve the quality of measurement of their standardized testing program by giving each student a test matched to his achievement level. This type of program has several attractive features. It provides more valid measurement of students who are at the high or low end of the achievement level for their grade. Many students who have never successfully answered more than a few of the easiest items on a standardized test, find the off-level test to be their first positive testing experience. Since students are less likely to become frustrated or bored, there are fewer classroom disturbances and the test administration goes more smoothly.

The districts who have implemented off-level testing, however, have run into serious problems. Most have relied on grade-equivalent scores and have been disappointed. In particular, those districts with a sizeable percentage of inner-city students have found that the move to an off-level program causes their grade-equivalent averages to drop precipitously because of the non-linearity of the grade-equivalent scale. Other more conscientious districts have tried to use the publisher's tables to equate raw scores between tests. These districts have found, however, that the equating tables do not provide the precise conversion they had hoped. (A quick check of the scores at the top and bottom usually suffices to prove the tenuous nature of these tables.)

In planning for our district multi-level testing program, we decided to develop content-referenced tests with a short range of item difficulty matched to each student. To accomplish this we needed to establish a reliable procedure for using results from the previous year to determine which test would best suit each student. The problems encountered by other districts convinced us to pursue a different approach. Together with fifty other districts in Oregon and Washington, we worked through the Northwest Evaluation Association to develop item banks in reading, mathematics, and language arts. Two important aspects of this work were the development of a better system for specifying the content covered by the items, and the specification of the level of the item on an equal interval scale. Through the leadership of Drs. Doherty and Hathaway, the content problem was solved by the development of course-goal collections in twelve school subjects. Unlike the unevenness encountered in most collections of behavioral objectives, these collections provide complete coverage of the subject by goals at a specified level of generality. To specify the item level, we decided to use the Rasch model which had two major advantages over traditional approaches: it does not require random sampling, and it scales achievement against the subject area, without the need for a norm group.

After four years of research and work with the Northwest Evaluation

*Presented at the A.E.R.A. Annual Conference, Toronto, March 1978 , Session 8.13.

Association item banks, we developed our district's testing program using a technology significantly advanced over that ;used by the test publishers promoting off-level testing.

Objectives

At the urging of our Superintendent, we launched two new testing programs in fall 1977. The first was a grade level based "competency progress" program, designed to identify students performing below a minimal level on eight to ten target goals. The second was the "level" program designed to provide each student a test matched to his achievement level.

Methods

The first step in launching these programs was the production of the tests. To guide our work, we developed test blueprints to specify the content coverage and the level of the items to be included on each test form. At this point, we decided to standardize on a test length of forty items so that all tests could be administered in a group setting with a single set of instructions. The competency progress (CP) tests were intended to identify students needing special remediation, so we selected items focused on measurement at a point one standard deviation below the district average at each grade level. In this way we hoped to identify the students who were below the 17th percentile, about the proportion to whom we can provide remedial services. The blueprints for the twelve competency progress tests (six reading, six math) are shown in Figures 1 and 2.

We modified the CP testing program to provide placement information for the subsequent level-testing programs. Through arrangement with our data processing department, we planned to use the scores on the CP test to assign the level tests. This, in turn, required raising the ceiling of the CP tests, by including four to six additional items chosen specifically for this purpose. Figure 3, shows an example of the way in which the placement items extended the measurement on one of the CP tests.

The level tests were built with quite a different philosophy. They were designed to each cover a small range of achievement in depth, cutting across grade levels. For example, the same form might fit an average sixth grader, a high level fourth grader and a low level eighth grader equally well. Each of the 14 reading tests and 19 mathematics tests spanned fifteen Rasch units with an overlap of five units between forms. Our final design is shown in Figure 4. In addition to the level specification, the tests were constructed to cover the goals shown in Figures 5 and 6.

After the blueprints had been established, district curriculum personnel selected the items for each test from the Northwest Evaluation Association item banks. As would be expected, shortages of items for some goals required additional item writing and compromises, but the banks make it possible to come up with a finished product in just a few weeks. Subsequent to this was a frantic period of typing, proofing, and printing of the forms, the preparation of the teacher and test coordinator manuals and the preprinting of the answer sheets.

The CP tests were administered in mid-September and by working overtime we were able to return the reports from these tests within a week of testing. (An example of the competency progress test report is shown in Figures 7 and 8.) Using the CP scores, we assigned a level test to each student, preprinting the form number on the snswer sheet and printing a class list for the teacher's use. Through all of this, the cooperation of the principals, test coordinators, and teachers was magnificent, and the testing of approximately 24,000 students went very smoothly. Since it was vital that this fall's results provide both the link backward to our district standardized testing program as well as forward, we checked and double checked our analysis of the fall data to

anchor our Rasch curriculum-based scale as firmly as possible, before producing the level test report shown in Figure 9.

## Results

The data from the level test program pointed out some interesting relationships. As shown in Figure 10, the standard deviation at any grade was about two and one half times as large as the difference in averages between the grades, indicating the dominance of the individual differences among students.

A second source of information was the comparison between student's performance on the two testing programs, as shown in Figure 11 the overall results matched well for every grade except where the CP tests introduced a floor or ceiling effect. Further analysis showed an even more interesting pattern. Students scoring either very high or very low on the CP test tended to have a less extreme score on the level test, as would be expected by regression to the mean. Taking this into account, however, it appeared that the lowest students at each grade did significantly better on the level tests than on the harder CP test. This was quite encouraging, since these were many of the students we hoped to reach with the program.

## Looking Forward

We have begun working on several new developments. First, we are in the process of combining the two programs into a single level based testing program to reduce the testing time to forty minutes in a subject. Second, we will use this year's test results to assign tests to students next fall, and so have eliminated the placement problems we have had in the past. Third, we are expanding the program to include language arts as well as reading and mathematics, with a special section on spelling. Next year at this time, we hope to have an equally favorable report to present on these new developments.

## Summary

As a result of using the Rasch model in building item banks in reading and mathematics, we were able to design two new testing programs for our district. The first was a grade level competency-based evaluation program designed to identify our district's low achievement-level students as well as the precompetency goals on which they needed help. The second was an ungraded testing program designed to replace our wide-range standardized testing by a series of short level tests which were assigned to students to match their individual achievement levels. In undertaking this task, we found that the Rasch-calibrated item bank made it possible to precisely design these tests to meet the needs of our district. Based on this year's experience, we believe that item banks with Rasch scaling provide a level of flexibility and precision unavailable in the past.

# Figure 1

Reading Competency Progress Test Goals and Numbers of Items per Goal

| Goal # | Long Form of Goal Statement - (For use on Competency Progress Test Class Report). | Short Form * 1 2 3 4 5 6 7 8 9 10 11 | Number of Items on each Goal and each Part of the Tests: Grade 3 Test Level 131 | Grade 4 Test Level 141 | Grade 5 Test Level 151 | Grade 6 Test Level 161 | Grade 7 Test Level 171 | Grade 8 Test Level 181 |
|---|---|---|---|---|---|---|---|---|
| Goal 1 | The student can interpret the meaning of commonly used words. | W O R D M N G . | Part 1 4 items | Part 1 4 items | Part 1 4 items | Part 1 4 items | Part 1 4 items | Part 1 4 items |
| Goal 2 | The student can comprehend literally stated written materials. | L I T . C O M P . | Part 2 8 items | Part 2 8 items | Part 2 8 items | Part 2 8 items | Part 2 8 items | Part 2 8 items |
| Goal 3 | The student can interpret implied meanings in written materials. | I N T . C O M P . | Part 3 4 items | Part 3 4 items | Part 3 4 items | Part 3 4 items | Part 3 4 items | Part 3 4 items |
| Goal 4 | The student can evaluate the intent, validity and worth of written materials. | C R I T . C O M P . | Part 4 4 items | Part 4 4 items | Part 4 4 items | Part 4 8 items | Part 4 8 items | Part 4 9 items |
| Goal 5 | The student can understand written directions. | D I R E C T N S . | Part 5 4 items | Part 5 4 items | Part 5 4 items | Part 5 4 items | Part 5 4 items | Part 5 4 items |
| Goal 6 | The student can locate written information with the help of indexes, tables of contents and other standard guides. | L O C . I N F . | Part 6 4 items | Part 6 4 items | Part 6 5 items | Part 6 6 items | Part 6 4 items | Part 6 5 items |
| Goal 7 | The student can locate and use sources of written information. | U S E b S R C S . | Part 7 4 items | Part 7 4 items | Part 7 5 items | Part 7 4 items | Part 7 8 items | Part 7 6 items |
| Placement Items | These items are designed to help get the right Level Test to each student | (Not reported on Goal Reports) | Part 8 8 items | Part 8 8 items | Part 8 6 items | Part 8 2 items | 0 items | 0 items |
| | | Total # of Goals | 7 | 7 | 7 | 7 | 7 | 7 |
| | | Total # of Items | 40 | 40 | 40 | 40 | 40 | 40 |

* (For use on Competency Progress Test Student Report. This short form will also appear in parentheses behind the long form where it is used on the Class Report.)

FIGURE 2

Math Competency Progress Test Goals and Numbers of Items per Goal

| Goal # * | Long Form | Short Form ** | # of Items | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Grade 3(231) | Grade 4(241) | Grade 5(251) | Grade 6(261) | Grade 7(271) | Grade 8(28 |
| Goal 1 | The student can add whole numbers . | 1 2 3 4 5 6 7 8 / + W H L | Part 1 4 items | Part 1 4 items | Part 1 4 items | | | |
| Goal 2 | The student can subtract whole numbers. | - W H L | Part 2 4 items | Part 2 4 items | Part 2 4 items | | | |
| Goal 3 | The student can multiply whole numbers. | x W H L | | Part 3 4 items | Part 3 4 items | | | |
| Goal 4 | The student can divide whole numbers. | / W H L | | | Part 4 4 items | | | |
| Goal 5 | The student can add and subtract whole numbers. | + - W H L | | | | Part 1 4 items | | |
| Goal 6 | The student can multiply and divide whole numbers. | x / W H L | | | | Part 2 4 items | | |
| Goal 7 | The student can add, subtract and multiply fractions. | + - x / F R | | | | Part 3 4 items | | |
| Goal 8 | The student can add, subtract, multiply and divide whole numbers. | + - x / W H L | | | | | Part 1 4 items | Part 1 4 items |
| Goal 9 | The student can add, subtract, multiply and divide fractions. | + - x / F R C | | | | | Part 2 4 items | Part 2 4 items |
| Goal 10 | The student can add, subtract and multiply decimals. | + - x D E C | | | | | Part 3 4 items | |
| Goal 11 | The student can add, subtract, multiply and divide decimals. | + - x / D E C | | | | | | Part 3 4 items |
| Goal 12 | The student can solve everyday problems that involve computation. | P R O B S | Part 3 5 items | Part 4 5 items | Part 5 4 items | Part 4 4 items | Part 4 4 items | Part 4 4 items |
| Goal 13 | The student can identify equivalent forms of a number. | E Q U I V S | Part 4 5 items | Part 5 5 items | Part 6 4 items | Part 5 4 items | Part 5 4 items | Part 5 4 items |
| Goal 14 | The student can make accurate estimates of the solutions to basic mathematical problems. | E S T I M S | | | | Part 6 4 items | Part 6 4 items | Part 6 4 items |
| Goal 15 | The student can apply basic measurement skills. | M E A S | Part 5 5 items | Part 6 5 items | Part 7 4 items | Part 7 4 items | Part 7 4 items | Part 7 4 items |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Goal 15 | The student can apply basic measurement skills. | M E A S | Part 5<br>5 items | Part 6<br>5 items | Part 7<br>4 items | Part 7<br>4 items | Part 7<br>4 items | Part 7<br>4 items |
| Goal 16 | The student can order and compare numbers. | O R & C O M | Part 6<br>5 items | Part 7<br>5 items | Part 8<br>4 items | Part 8<br>4 items | Part 8<br>4 items | Part 8<br>4 items |
| Goal 17 | The student can interpret and display graphic and statistical information. | S T A T | | | Part 9<br>4 items | Part 9<br>4 items | Part 9<br>4 items | Part 9<br>4 items |
| Goal 18 | The student can recognize and work with basic geometric figures. | G E O M | Part 7<br>5 items | Part 8<br>5 items | Part 10<br>4 items | Part 10<br>4 items | Part 10<br>4 items | Part 10<br>4 items |
| Placement Items | These items are designed to help get the right Level Test to each student. | (Not reported on Goal Reports) | Part 8<br>6 items | Part 9<br>6 items | Part 11<br>4 items | Part 11<br>4 items | Part 11<br>4 items | Part 11<br>4 items |
| | | Total # of Goals | 7 | 8 | 10 | 10 | 10 | 10 |
| | | Total # of Items | 39 | 43 | 44 | 44 | 44 | 44 |

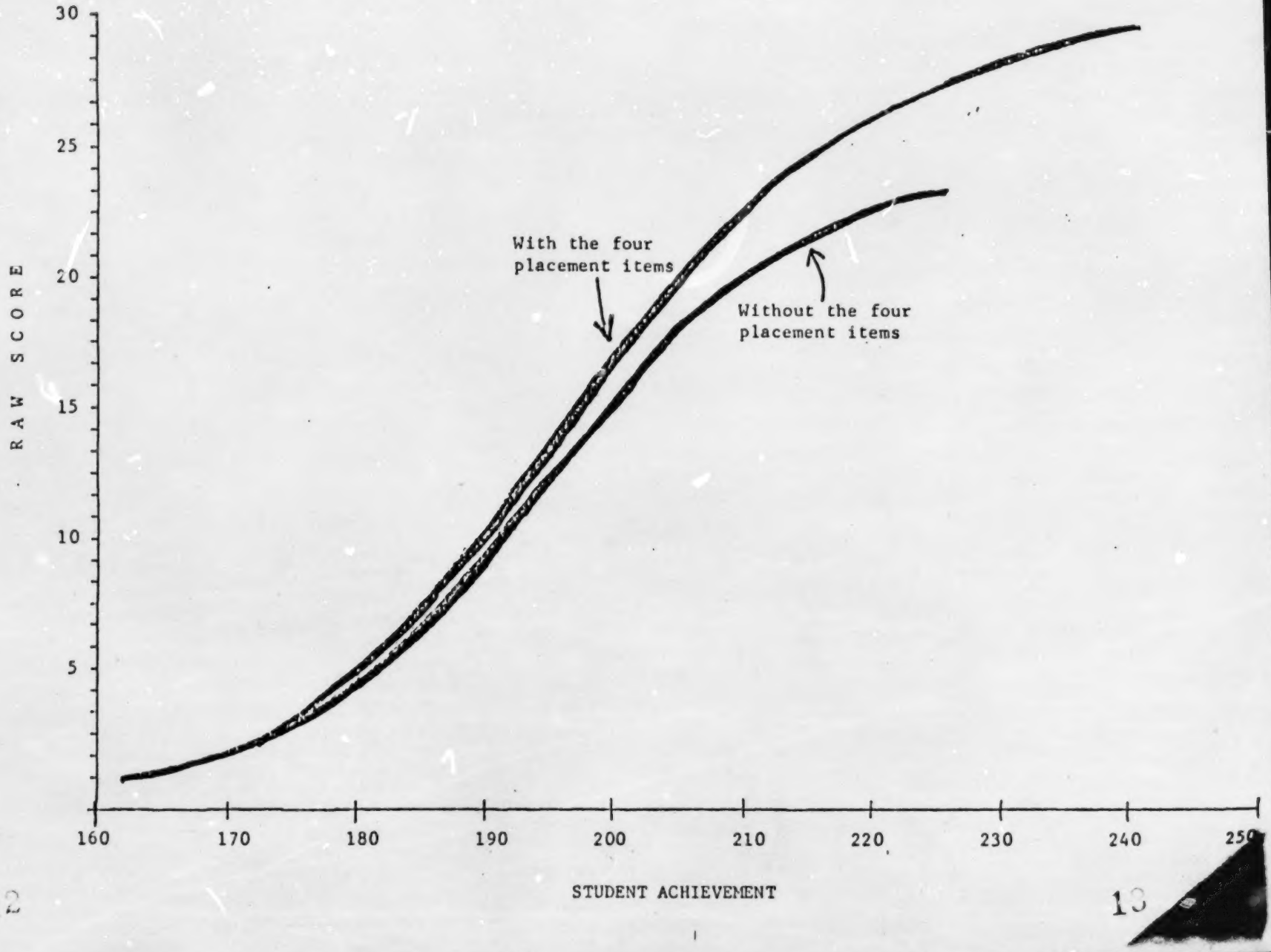
* For Mathematics, when goal numbers are used on the Class Report, they will correspond to the Part Number of all but the last (Placement item) part of each test and not to the Goal number in the far left-hand column. Thus, e.g., the Grade 3 report will use as Goal numbers 1-7 and not 1,2, 12, 13, 15, 16, 18.

** Short form should appear in parenthesis behind long form wherever it is used e.g. on class reports.

***The "/" symbol is being used to indicate "division" due to its being the closest character in the computer character set.

FIGURE 3

Test Curves for the Eighth Grade Mathematics Precompetency Test



Ranges of Difficulty for the Level Tests - Figure 4

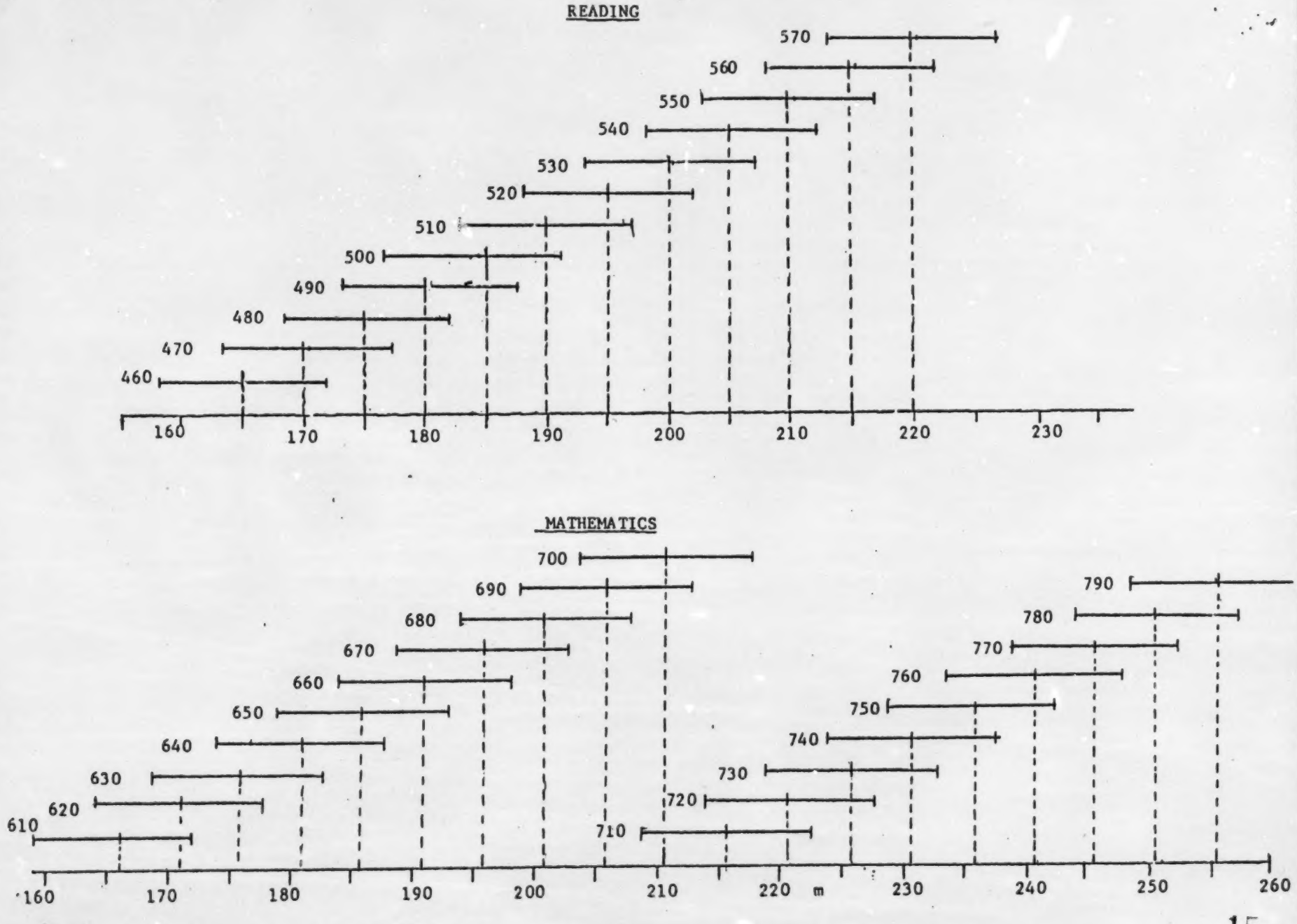


Figure 5

Portland Public Schools

1977 READING LEVEL TESTS BLUEPRINT

| | | J | K | L | M | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 165-180 | 170-185 | 175-190 | 180-195 | 185-200 | 190-205 | 195-210 | 200-215 | 205-220 | 210-225 | 215-230 | 220-235 |
| Word Meaning 4.3 | Context 4.3.1.2.1 | 8 | 8 | 8 | 6 | 4 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| | Dictionary 4.3.1.2.2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Syn, Ant, Hom 4.3.1.2.3 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 4 | 4 | 4 |
| | Affixes 4.3.1.2.5 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 2 | 2 |
| Recall 4.3 | Details 4.3.2.1.1 | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 7 | 6 | 6 | 4 | 4 |
| | Main Ideas 4.3.2.1.2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 4 |
| | Sequence 4.3.2.1.3 | 4 | 4 | 4 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 0 |
| | Classification 4.3.2.1.4 | 4 | 4 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Interpretation 4.3 | Summary & Synthesis 4.3.2.1.5 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 4 |
| | Prediction 4.3.2.1.6 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| | Fact & Opinion 4.3.2.2.1 | 0 | 0 | 0 | 0 | 1 | 4 | 4 | 4 | 3 | 2 | 2 | 2 |
| | Inference 4.3.2.2.3 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 4 | 5 | 3 |
| | Underlying Assum. 4.3.2.2.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 5 |
| Evaluation 4.3 | Quality 4.3.2.2.5 Character 4.3.2.2.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 3 |

Figure 6

# GOAL DISTRIBUTION OF ITEMS ON 1977 MATH LEVELS TESTS

| GOAL | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Use whole numbers. | 23 | D 24 | 24 | 24 | 22 | 18 | 14 | 15 | 16 | 15 | 9 | 8 | 5 | 6 | 6 | | | | |
| 2. Add whole numbers. | 12 | 10 | 8 | 8 / 1 | 7 / 1 | ① 4 | 3 / 1 | 3 | 3 / 1 | 3 | | 1 | 1 | | 1 | | | 1 | |
| 3. Subtract whole numbers. | 10 | 10 | 11 | 8 | 6 / 1 | 5 / 1 | 4 | ③ 4 / 1 | 3 / 1 | 4 | 2 | 1 | 1 | | 1 | | | 1 | |
| 4. Multiply whole numbers. | 1 | ③ 4 | ① 5 | 4 / 1 | 4 | 5 / 2 | ① 4 / 1 | 4 | 6 | 4 | 3 | 2 | | 2 | | 1 | | 1 | |
| 5. Divide whole numbers. | | | | 4 / 2 | ① 5 / 2 | 4 / 3 | 3 / 2 | ① 4 / 2 | 4 / 1 | 4 | 4 | 4 | 3 | ① 4 | ① 4 / 1 | 1 | | | |
| 6. Use whole number numeration. | ① 6 / 1 | ① 4 / 4 | ① 4 / 4 | 4 / 2 | 5 / 1 | 6 | 6 | 4 / 3 | 4 / 1 | 4 | 4 | 4 | 4 / 1 | 3 | 1 | 1 / 1 | 1 | 1 | 4 |
| 7. Use fraction & decimal concepts. | ① 1 | ③ 3 / 3 | ① 5 | 5 | 4 | 6 | 5 / 4 | 3 | 3 | 3 / 1 | ① 6 / 1 | 7 / 3 | 7 | 7 / 5 | 7 / 2 | 10 / 2 | 11 / 2 | 9 | ① 8 |
| 8. Compute with fractions. | | | | | | | | | 3 | 3 | 3 / 1 | ① 4 / 4 | ① 4 | 5 / 3 | ① 7 | 5 / 2 | 4 | 4 | 3 |
| 9. Compute with decimals. | | | | | | 1 | 3 / 1 | 4 | 4 / 1 | 4 / 1 | ① 4 / 1 | 4 | 5 | 6 | 5 | 4 | 4 | 6 | 4 |
| 10. Use geometry. | ② 3 / 3 | 2 / 2 | ③ 3 / 1 | ① 3 | ② 4 / 1 | 3 | 3 | 4 / 1 | 3 / 2 | 3 | ① 4 / 1 | 3 / 2 | ① 4 / 2 | 3 / 3 | 3 / 4 | 3 / 4 | 5 / 5 | 4 / 4 | 6 / 3 |
| 11. Use measurement. | ③ 3 / 3 | ③ 3 | 3 / 2 | 3 / 1 | 3 / 1 | 3 / 1 | 3 / 1 | 3 / 5 | 3 / 4 | 3 / 5 | ① 4 / 1 | ① 4 / 1 | 3 / 2 | 3 | 3 / 2 | 4 | 4 | 4 | / 1 |
| 12. Use graphs, statistics and probability. | 1 | | 3 / 1 | 3 / 1 | 3 | 3 / 2 | 4 / 3 | 4 | 3 / 1 | 3 / 5 | 3 / 1 | 3 | ① 3 / 3 | 3 / 4 | 3 / 2 | ② 4 | 1 / 4 | 7 / 6 | / 3 |
| 13. Apply knowledge of no. & no. operations & properties to problem solving. | 4 / 4 | ① 6 | 4 | 4 / 1 | ③ 6 / 1 | 6 / 3 | 4 / 3 | 4 / 5 | 4 / 1 | 4 / 3 | 4 / 2 | 4 / 3 | 4 / 1 | ① 4 / 4 | ③ 4 / 2 | 4 / 6 | 7 / 4 | ① 5 / 4 | 10 / 4 |
| 14. Use positive & negative numbers. | | | | | | | | | | | | | ① 1 | 2 | 2 | 3 | 3 | 3 | 5 |
| | 4 - 4+<br>2 - 3<br>2 - 1 | 5 - 4+<br>2 - 3<br>1 - 2<br>1 - 1 | 6 - 4+<br>3 - 3 | 7 - 4+<br>3 - 3 | 8 - 4+<br>2 - 2 | 7 - 4+<br>3 - 3 | 6 - 4+<br>5 - 3 | 8 - 4+<br>3 - 3 | 5 - 4+<br>7 - 3 | 6 - 4+<br>6 - 3 | 6 - 4+<br>4 - 3<br>1 - 2 | 7 - 4+<br>2 - 3<br>1 - 2<br>2 - 1 | 6 - 4+<br>3 - 3<br>1 - 2<br>2 - 1 | 5 - 4+<br>4 - 3<br>1 - 2 | 5 - 4+<br>3 - 3<br>1 - 2<br>4 - 1 | 6 - 4+<br>2- 3<br>3 - 1 | 6 - 4+<br>1 - 3<br>3 - 1 | 6 - 4+<br>1 - 3<br>1 - 2<br>4 - 1 | 6 - 4+<br>1 - 3 |
| Total Goals | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 12 | 11 | 12 | 12 | 10 | 13 | 11 | 10 | 12 | 7 |
| No. of goals with 3 or more items | 6 | 7 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 12 | 10 | 9 | 9 | 9 | 8 | 8 | 7 | 7 | 7 |

▨ 4 or more items per goal

▨ 3 items per goal

▨ 2 items per goal

*Figure 7

SCHOOL 140 HOLLADAY TEACHER MYERS GRADE 5 10/25/77

FALL 1977 MATHEMATICS COMPETENCY PROGRESS TEST
STUDENT REPORT

| STUDENT | GOALS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | +WHL | -WHL | XWHL | /WHL | PROBS | EQUIVS | MEAS | ORGCOM | STAT | GEOM |
| ERIC L | PASS | | | PASS | PASS | | | PASS | | PASS |
| MIKE | PASS | PASS | PASS | PASS | PASS | | PASS | PASS | PASS | |
| DENISE P | PASS | PASS | PASS | PASS | PASS | | PASS | PASS | | |
| SHANNON P | PASS | | PASS | PASS | PASS | | | PASS | | |
| * TRAVIS B | | PASS | PASS | | PASS | | | | | |
| P LISA | PASS | PASS | PASS | | PASS | | | | | |
| CAROLE D | PASS | | PASS | | PASS | | PASS | | | PASS |
| APRIL M | PASS | | PASS | | PASS | PASS | | PASS | | |
| SCOTT P | PASS | | PASS | | PASS | | | PASS | | |
| SHAWN P | PASS | PASS | PASS | PASS | PASS | | PASS | PASS | | PASS |
| ELIZABETH A | PASS | PASS | PASS | PASS | | | | | | |
| * DONALD M | PASS | PASS | | | | | | | | |
| GORDON P | PASS | PASS | PASS | PASS | PASS | | | | | PASS |
| RICHARD FENE | PASS | | PASS | PASS | PASS | | | PASS | PASS | PASS |

* INDICATES MINIMUM STANDARDS TARGET STUDENT

*Data has been fictionalized to assure anonymity.

*Figure 8

SCHOOL 146 HOLLADAY TEACHER MYERS GRADE 5 10/25/77

FALL 1977 MATHEMATICS COMPETENCY PROGRESS TEST
CLASS REPORT - 14 STUDENTS IN THIS CLASS

| GOAL | STUDENTS PASSING | STUDENTS POSSIBLY NEEDING ADDITIONAL WORK ON THIS GOAL | |
|---|---|---|---|
| 1. THE STUDENT CAN ADD WHOLE NUMBERS. ( +WHL ) | 13 | TRAVIS B | |
| 2. THE STUDENT CAN SUBTRACT WHOLE NUMBERS. ( -WHL ) | 9 | ERIC L<br>SHANNON R<br>CAROLE D | APRIL M<br>SCOTT R<br>RICHARD ERNE |
| 3. THE STUDENT CAN MULTIPLY WHOLE NUMBERS. ( XWHL ) | 12 | ERIC L | DONALD W |
| 4. THE STUDENT CAN DIVIDE WHOLE NUMBERS. ( /WHL ) | 8 | TRAVIS B<br>R LISA<br>CAROLE D | APRIL M<br>SCOTT R<br>DONALD W |
| 5. THE STUDENT CAN SOLVE EVERYDAY PROBLEMS THAT INVOLVE COMPUTATION. ( PROBS ) | 12 | ELIZABETH A | DONALD W |
| 6. THE STUDENT CAN IDENTIFY EQUIVALENT FORMS OF A NUMBER. ( EQUIVS ) | 1 | ERIC L<br>MIKE<br>DENISE P<br>SHANNON P<br>TRAVIS B<br>R LISA<br>CAROLE D | SCOTT R<br>SHAWN M<br>ELIZABETH A<br>DONALD W<br>GORDON M<br>RICHARD ERNE |
| 7. THE STUDENT CAN APPLY BASIC MEASUREMENT SKILLS. ( MEAS ) | 4 | ERIC L<br>SHANNON R<br>TRAVIS B<br>R LISA<br>APRIL M | SCOTT R<br>ELIZABETH A<br>DONALD W<br>GORDON M<br>RICHARD ERNE |
| 8. THE STUDENT CAN ORDER AND COMPARE NUMBERS. ( ORDCOM ) | 8 | TRAVIS B<br>R LISA<br>CAROLE D | ELIZABETH A<br>DONALD W<br>GORDON M |
| 9. THE STUDENT CAN INTERPRET AND USE GRAPHS AND STATISTICS. ( STAT ) | 2 | ERIC L<br>DENISE P<br>SHANNON R<br>TRAVIS B<br>R LISA<br>CAROLE D | APRIL M<br>SCOTT R<br>SHAWN M<br>ELIZABETH A<br>JR DONALD W<br>GORDON M |
| 10. THE STUDENT CAN RECOGNIZE AND USE BASIC GEOMETRIC FIGURES. ( GEOM ) | 5 | MIKE<br>DENISE P<br>SHANNON R<br>TRAVIS B<br>R LISA | APRIL M<br>SCOTT R<br>ELIZABETH A<br>DONALD W |

*Data has been fictionalized to assure anonymity.

SCHOOL LAKEVIEW TEACHER JONES RUN DATE 01/07/78

*Figure 9

FALL 1977 ACHIEVEMENT LEVEL TEST STUDENT REPORT GRADE 05

ALPHA MATHEMATICS RIT SCALE: 170 178 185 193 200 207 215 222 230

M=40 M=60

| STUDENT NAME | N SCORE | RIT | VERY LOW | LOW | LOW AVERAGE | AVERAGE | HIGH AVERAGE | HIGH | VERY HIGH |
|---|---|---|---|---|---|---|---|---|---|
| RONALD | 48 | 197 | | | | X | | | |
| KELLY | 50 | 200 | | | | X | | | |
| RONALD | 53 | 204 | | | | X | | | |
| ADRIENN | 45 | 193 | | | | X | | | |
| DONALD | 41 | 187 | | | X | | | | |
| CHRISSY | 33 | 174 | X | | | | | | |
| LANCE | 39 | 184 | | X | | | | | |
| ADAM | 44 | 191 | | | X | | | | |
| NATHAN | 63 | 219 | | | | | | X | |
| MIKE | 47 | 196 | | | | X | | | |
| TIFFANY | 43 | 190 | | | X | | | | |
| ERIC | 39 | 184 | | X | | | | | |
| PARRISH | 56 | 209 | | | | | X | | |
| MERFDITH | 65 | 223 | | | | | | | X |
| BRYCE | 51 | 201 | | | | X | | | |
| MARK | 53 | 204 | | | | X | | | |
| HEATHER | 61 | 215 | | | | | | X | |
| MISSY | 62 | 218 | | | | | | X | |
| DEMETRIU | 47 | 195 | | | | X | | | |
| RANDY | 59 | 214 | | | | | X | | |
| SCOTT | 59 | 213 | | | | | X | | |
| DIN | 43 | 189 | | | X | | | | |
| BETTY | 56 | 209 | | | | | X | | |
| MICHELLE | 48 | 197 | | | | X | | | |
| DARCY | 59 | 214 | | | | | X | | |
| CHARLES | 49 | 198 | | | | X | | | |
| LONNIE | 45 | 192 | | | X | | | | |

* Data has been fictionalized to assure anonymity.

* = SCORE BASED ON THE COMPETENCY PROGRESS TEST

Figure 10

ACHIEVEMENT BY GRADE FROM THE LEVEL TESTS*

| READING | | | MATHEMATICS | | |
|---|---|---|---|---|---|
| GRADE | AVERAGE | STD. DEVIATION | GRADE | AVERAGE | STD. DEVIATION |
| 4 | 193.76 | 15.26 | 4 | 190.36 | 14.22 |
| 5 | 200.00 | 14.97 | 5 | 200.00 | 14.86 |
| 6 | 205.74 | 15.17 | 6 | 208.36 | 14.54 |
| 7 | 211.21 | 14.85 | 7 | 214.87 | 14.79 |
| 8 | 216.83 | 14.79 | 8 | 221.41 | 15.16 |

*These results combine information across several test forms at each grade level.

Figure 11

COMPARISON OF RESULTS BETWEEN THE COMPETENCY PROGRESS AND ACHIEVEMENT LEVEL TEST PROGRAMS

| READING | | | MATHEMATICS | | |
|---|---|---|---|---|---|
| GRADE | CP* AVERAGE | AL** AVERAGE | GRADE | CP AVERAGE | AL AVERAGE |
| 4 | 194.12 | 193.75 | 4 | 191.28 | 190.36 |
| 5 | 200.00 | 200.00 | 5 | 200.81 | 200.00 |
| 6 | 205.53 | 205.74 | 6 | 207.22 | 208.36 |
| 7 | 209.77 | 211.21 | 7 | 213.49 | 214.87 |
| 8 | 214.74 | 216.83 | 8 | 222.15 | 221.41 |

*Competency Progress
**Achievement Level